APPENDIX A

(The following document, drawn up by the Magugu planters in February, 1944, pledges their support to the Government's clearing program.)

A G R E E M E N T

We the undersigned non-natives having interests in the Magugu-Sino area, voluntarily enter the following agreement amongst ourselves.

2. We agree to support in every possible way the Government scheme for saving the Magugu-Sino area from Tsetse Fly and Sleeping Sickness, as explained to us at the Meeting at Mbugwe on 26/2/44.

3. We understand that the only alternative to this scheme is complete evacuation of all natives from our farms as originally ordered by Government and that in the event of our withdrawing our support Government will revert to the original policy.

4. We agree to place our total labour force, with tools and headmen, at the disposal of Government for two-thirds of their time so long as clearing operations are in progress such labour to be paid by Government for days worked on clearing.

5. We agree to supervise, free of charge our own labour when working on clearings, to the satisfaction of the Officer i/c Sleeping Sickness Measures.[1]

6. We agree to place at the disposal of the Officer i/c Sleeping Sickness Measures such facilities as are available and may reasonably be demanded, such as store space, grinding facilities, vacant labour lines etc.

7. We agree to make every endeavour to increase our labour forces, any new labour to enter into the common pool on the 2/3 basis, on the understanding that should the labour situation in respect of clearing work so improve, either generally or on any particular estate,

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[1] i/c means "in charge".

that the 2/3 basis may later be reduced at the discretion of the committee.

8. We agree to furnish accurate information concerning labour food and tools on demand, and to allow access to our books pertaining to such matters.

9. We agree to pay the following penalties for each and every breach of the above agreement

(a) For witholding information or rendering false returns.....Shs. 20/-

(b) For refusing facilities reasonably demanded.....Shs. 20/-

(c) For witholding labour in excess of the one third allowed for estate work, Shs. 5/- per day for each labourer so withheld.

10. We agree in all the above matters to abide by the decision of the Officer i/c Sleeping Sickness Measures when sitting with the two representatives (Mr. G. Combos and Mr. A. Apokides) elected by ourselves in open meeting.

11. We agree that any funds obtained from penalties shall be utilized for the benefit of the Magugu area as decided by the committee.

APPENDIX B

Because the terminology and units of measurement of the soil scientist may not be understood by the general reader, the following extracts from one of the letters of Mr. John W. Vail, Soils Chemist for the Tanganyika Government, will give assistance in this matter.

pH.--This is a mathematical symbol which expresses the hydrogen ion concentration. In simple language, it expresses the reaction of the soil---either acid, alkaline or neutral. pH 7.0 represents neutrality, figures below 7.0 represent the acid side, and figures above 7.0 the alkaline side. It is extremely rare to find a soil with a pH more acid than 4.0 or more alkaline than 10.

Conductivity.--This is a measure of the electrical conductivity of the soil solution. Distilled water has zero conductivity and the greater the amount of salts dissolved in the water the greater is its conductivity. Soil conductivity therefore tells us the amount of dissolved salts in the soil solution; i.e. its salinity. Conductivity is usually expressed in micromhos/cm., and a figure of 500 is regarded as the safe limit below which the health of crops is in no way affected by the concentration of salts in solution. As a very rough guide it can be said that:

from 500-900 salt sensitive crops do not thrive; tolerant crops do well.
900-2000 crop growth restricted; yields poor.
Over 2000 only a few species survive.

However it cannot be too strongly emphasized that the effect of soil salinity on crops is controlled by other factors in addition to the salt concentration of the soil solution as expressed by conductivity. The most important of these are exchangeable sodium levels (see below), soil structure, and the salt tolerance of the crop itself.

Exchangeable calcium.--This figure is a measure of the amount of calcium present in the soil in a form available to plants. That is to say, it is the calcium held in an exchangeable form on the soil colloids, both organic and inorganic, as opposed to the total soil calcium. Total calcium would also include the calcium

present in the rock and mineral fragments, which is, of course, not available to plants until after the fragments have been broken down by weathering in the normal course of soil formation.

The level of exchangeable calcium is important for it gives in most cases an idea of the levels of the other major metallic nutrients---magnesium and potassium---since the levels of these are usually in a constant proportion to the amount of calcium present. That is why for ordinary routine work only calcium is determined, but, of course, one can determine exchangeable potassium and magnesium as well where necessary.

Each soil type has a limit to the amount of exchangeable ions it can hold. The total amount is called the exchange capacity of the soil and depends on the type of colloids present in the soil. From the soil fertility angle exchange capacity is obviously an important concept---one needs to know, for example, not only how much calcium a soil contains but also what is the maximum it is likely to be able to hold if saturated by the addition of lime. An excess of lime, particularly on tropical soils of low exchange capacity, can lead to serious nutritional disturbances with the trace elements.

If the soil colloids are not holding exchangeable ions to the full extent of their capacity the soil is said to be 'unsaturated' and the 'empty seats' on the colloids are to some extent filled by hydrogen (known as) 'exchangeable hydrogen'. However, usually pH is used to express the degree of unsaturation of a soil rather than the term 'exchangeable hydrogen'. Obviously the more hydrogen on the exchange complex the more acid the soil and the lower the pH.

As a rough guide one can say that in the red soils or any well-drained soils, exchangeable calcium should be at 6-8 m.e.% in the topsoil falling to 2-3 m.e.% at 5 feet in a normal soil of average fertility by Tanganyika standards. In the mbugas and other poorly drained sites you must expect 10-12 m.e.% calcium in the first few feet in a normal fertile soil. (m.e.% means milli-equivalents per 100 gms of soil)

Exchangeable sodium.--Normally sodium is present in the soils in only small amounts. However, under certain circumstances natural conditions will tend towards the accumulation of salts in the soil solution (accompanied by a rise in conductivity) and very often the predominant salts present are those of sodium. The high concentration of sodium gradually leads to the replacement

of calcium in the exchange complex by sodium. In other words the normal ratio of calcium to sodium is completely reversed, and this process, known as alkalisation since it is accompanied by a sharp rise in pH, is very harmful to plants. The presence of excess sodium also has an adverse effect on soil structure, making the clay fraction sticky and impermeable. That is why when a soil is suspected to be saline or alkaline we estimate the exchangeable sodium and the proportion of the total exchange capacity of the soil that has been filled by sodium.

If more than 15% of the exchange capacity is filled by sodium the soil is said to be alkali and plant growth will be affected. Above 50% exchangeable sodium crop growth is very seriously affected.

Available phosphorus.--This determination is self-explanatory but results should be interpreted with caution as you can obtain different values of phosphorus depending on the analytical method used. We use the Truog method.

Organic carbon.--This is also self-explanatory. A measure of the amount of organic carbon in the soil... tells us approximately how much organic matter there is in the soil. More than 2% organic carbon in the topsoil is good, 1-2% average, 0.5-1% fair to low, and below 0.5% poor. The deeper the organic matter goes the better, but of course you don't get much below the top foot or so.

Soil analysis tells you the actual amount of such and such a substance in the soil but it doesn't tell you all about the availability of the substance to plants. A consideration for any one soil of all the analyses described above gives you some idea of soil fertility, but considerations of clay mineralogy, moisture regime, structure and the origin of the soil are often overriding factors. For example it is difficult to quote a figure for phosphorus or potash fertilizer. The problems of availability of these elements have yet to be solved, and one must take all the factors into consideration when assessing phosphorus or potash analyses.

One way of getting round this dilemma is to do analysis of growing crops. It is usually true that the amount of an element in the plant is a measure of its relative supply in the soil. That is why in crop fertility problems...leaf analysis (are done) in conjunction with soil analysis. Furthermore leaf analysis is the only sure way of assessing the trace element requirements of crops---soil analysis for trace elements is of very limited value.

Note.--It should be pointed out that no leaf analyses were made at Magugu, though such obvious examples (of crops maladjusted to soils) as yellowed coffee leaves and stunted paw paws were in ample evidence. Considering the pattern of African crop distribution, such studies would not be practical at Magugu unless large sums of money and huge amounts of manpower were available for such work.

APPENDIX C

MAGUGU TRIBAL DISTRIBUTION, MAY, 1954

Tribe	Number
Arusha	4
Bondei	2
Burungi	4
Bunga	3
Chagga	7
Fipa	3
Ganda	1
Gogo	8
Gorowa	1
Ha	4
Heho	4
Iramba	32
Irangi	39
Iraqw	6
Izanzu	3
Kami	2
Kerewe	1
Kikuyu	1
Kimbu	6
Kitosi	1
Konongo	1
Kusa	1
Luo (Jaluo)	9
Makonde	3
Makua	10
Maragoli	1
Masai	1
Mbugwe	89
Mbunga	1
Nambwe	2
Naryema	2
Ngoni	5
Nubi	3
Nyakusu	4
Nyamwezi	33
Nyasa	4
Nyaturu	21
Pimbwe	5
Rufiji	2
Rundi	6
Sandawi	7
Sangu	1
Shashi	2
Shirazi	1
Soga	1
Subi	1
Sukuma	23
Sumbiji	1
Sumbwa	4
Tumbatu	4
Tutsi	2
Wasi	1
Yao	9
Zaramo	2
Zinza	1
Total	395

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